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by Mr. William Tongue, Engineer, formerly an apprentice to the late James Watt, and for several years afterwards foreman of his works. The ordinary chain broke at a pressure of 15 tons, while Mr. Cutler's chain broke, through a flaw in one of the links, while sustaining 36 tons.

ON A PATENT TUBE FOR LOCOMOTIVE AND MARINE BOILERS.

By Mr. Job Cutler.

Tubes were first introduced into steam-engine boilers by M. Seguin; it has since been found that the cost of the original tubes, and also that of repairing them, has been excessive, and that every engine, according to Tredgold and our best authorities, has required to have the whole of the tubes removed and replaced by new ones about once in every two years; and this, exclusive of the tubes used in the intermediate time for repairing or replacing those tubes which, from being nearest the fire, had been worn out in one quarter the time of the others.

Mr. Cutler's tubes may be made of common iron, but he prefers that they should be made of what is termed best or charcoal iron, as they would be rendered easier to work and more durable. The tubes may be welded in the ordinary way, only, instead of making them (as iron tubes have heretofore been welded, for gas and other purposes) with a jump joint, he makes them with a lap-over joint, which presents a stronger resistance to the force of both fire and steam than does the former. After the tubes have been welded he inserts a bright steel mandril or triblet, and then draws them through a hole or wortel, commonly called a die or bed, and which is placed upon a draw-bench; the drawing is performed by the end of the tube being inserted through the hole or bed, and then grasped by a pair of pliers attached to an endless chain, and the motion being thrown on, it is drawn through in the usual way. The whole length of the mandril over which the tube is drawn does not pass through the hole or wortel, as in this case there might be a slight difficulty in extracting it, or, at least, it would occupy some time in so doing, but it is made stationary, with the triblet end passing a few inches through the hole or wortel, and the tube is drawn down and off the mandril. This process has the effect of straightening the tube, laying smooth any blister which may have risen upon the iron in its hot state, rendering it perfectly cylindrical, and laying the grain all one way, and rendering it closer, thereby increasing the consistency and durability of the tube. By this method, also, the tubes may be rendered bright, and have a polished appearance, or, after having been so drawn as above described, they may be blued in the usual manner, and which appearance is mostly preferred by engineers. The end upon which has been placed the gripe being then cut off, the tube is fit for use. These tubes are sold at about 6*d.* per lb., which is a reduction of 8*d.* per lb. upon the price charged for brass tubes. The following calculation is presented, as representing the nature and amount of the saving : —

	£	*s.*	*d.*	£	*s.*	*d.*
BRASS TUBES.						
One set of 130 tubes, 30 cwt. at 1*s.* 2*d.* per lb.	196	0	0			
Say, during two years, 50 required for repairs, 12 cwt. at 1*s.* 2*d.* per lb.	78	8	0			
				274	8	0
IRON TUBES.						
One set of 130 tubes, 23 cwt. 24 lbs. at 6*d.* per lb.	65	0	0			
Required for repairs, 30 tubes, 5 cwt. 1 qr. 12 lbs. at 6*d.*	15	0	0			
				80	0	0
Difference per engine				£194	8	0

The great difference in weight is caused by the difference in the specific gravity of the two metals, and also by the difference in thickness, as the iron, being of a much more durable nature, can be made much thinner ; as if brass is used at 12 of the wire-gauge, iron tubes may be made of 13 or 14 of the wire-gauge ; but even supposing the weight to be the same, the difference in a set of tubes would be —

	£	*s.*	*d.*
Brass tubes, 30 cwt. at 1*s.* 2*d.* per lb.	196	0	0
Iron tubes, 30 cwt. at 6*d.* per lb.	84	0	0
Being a saving of tubing, in every engine, of	£112	0	0

So that if the London and Birmingham Railway Company have 100 engines, and use in each engine, every *four* years, only 30 cwt. of tubes, the saving to them, by using iron tubes, would be, for the four years, 11,200*l.*

An object which Mr. Cutler considers of great importance is, that in consequence of the iron being thinner and so much better a conductor of heat than brass, the steam would be generated much quicker, thereby effecting a great saving of fuel, and affording a greater capability of raising the steam at any period in a shorter space of time, when wanted in a hurry, or when, by an injection of too great a quantity of cold water, the rarefaction of the steam is lessened.